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1 Routine/Function Prologues

1.0.1 **clm2_tileout.F90** (Source File: *clm2_tileout.F90*)

LIS CLM2 data writer: Write CLM2 output in tile space

REVISION HISTORY:

02 Dec 2003: Sujay Kumar; Initial Version

INTERFACE:

```
subroutine clm2_tileout(ld,tile,ftn,ftn_stats)
```

USES:

```
use lis_module
use tile_module
use clm_varcon, ONLY : denh2o, denice, hvap, hsub, hfus, istwet
use clm_varpar, ONLY : nlevsoi
use clm_varmap, ONLY : patchvec
use clm_varder
```

CONTENTS:

```
soilmtc=0.0
delsoilmoist = 0.0
delswe = 0.0
soilmr=0.0
soilwtc=0.0
!-----
! Net Surface Shortwave Radiation (W/m2)
!-----
clm%totfsa=clm%totfsa/float(clm%count)
call t2gr(clm%totfsa,gtmp,ld%d%glbngrid,ld%d%glbnch,tile)
write(ftn) gtmp
!-----
! Net Surface Longwave Radiation (W/m2)
!-----
clm%toteflx_lwrad_net=-1.0*clm%toteflx_lwrad_net/float(clm%count)
call t2gr(clm%toteflx_lwrad_net,gtmp,ld%d%glbngrid,ld%d%glbnch, &
          tile)
write(ftn) gtmp
!-----
! Latent Heat Flux (W/m2)
!-----
clm%toteflx_lh_tot=clm%toteflx_lh_tot/float(clm%count)
call t2gr(clm%toteflx_lh_tot,gtmp,ld%d%glbngrid,ld%d%glbnch,tile)
write(ftn) gtmp
!-----
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! Sensible Heat Flux (W/m2)
!-----
clm%toteflx_sh_tot=clm%toteflx_sh_tot/float(clm%count)
call t2gr(clm%toteflx_sh_tot,gtmp,ld%d%glbngrid,ld%d%glbnch,tile)
write(ftn) gtmp
!-----
! Ground Heat Flux (W/m2)
!-----
clm%toteflx_soil_grnd=clm%toteflx_soil_grnd/float(clm%count)
call t2gr(clm%toteflx_soil_grnd,gtmp,ld%d%glbngrid,ld%d%glbnch, &
          tile)
write(ftn) gtmp
!-----
! General Water Balance Components (Time Averaged)
! Snowfall (kg/m2s)
!-----
clm%totsnow = clm%totsnow/float(clm%count)
call t2gr(clm%totsnow,gtmp,ld%d%glbngrid,ld%d%glbnch,tile)
write(ftn) gtmp
!-----
! Rainfall (kg/m2s)
!-----
clm%totrain = clm%totrain/float(clm%count)
call t2gr(clm%totrain,gtmp,ld%d%glbngrid,ld%d%glbnch,tile)
write(ftn) gtmp
!-----
! Total Evaporation (kg/m2s)
!-----
clm%totqflx_evap = clm%totqflx_evap/float(clm%count)
call t2gr(clm%totqflx_evap,gtmp,ld%d%glbngrid,ld%d%glbnch,tile)
write(ftn) gtmp
!-----
! Surface Runoff (kg/m2s)
!-----
clm%totqflx_surf = clm%totqflx_surf/float(clm%count)
call t2gr(clm%totqflx_surf,gtmp,ld%d%glbngrid,ld%d%glbnch,tile)
write(ftn) gtmp
!-----
! Subsurface Runoff (kg/m2s)
!-----
clm%totqflx_drain = clm%totqflx_drain/float(clm%count)
call t2gr(clm%totqflx_drain,gtmp,ld%d%glbngrid,ld%d%glbnch,tile)
write(ftn) gtmp
!-----
! Snowmelt (kg/m2s)
!-----
snowmelt=clm%totqflx_snomelt/float(clm%count)
call t2gr(snowmelt,gtmp,ld%d%glbngrid,ld%d%glbnch,tile)
```

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    write(ftn) gtmp
!-----
! Calculation of total column soil moisture
! Total soil moisture (liquid+ice) in each layer
!-----
    do m=1,nlevsoi
        do t=1,ld%d%glbnch
            soilm(t,m)=clm(t)%h2osoi_liq(m)+clm(t)%h2osoi_ice(m)
        enddo
    enddo

    do m=1,nlevsoi
        do t=1,ld%d%glbnch
            soilmtc(t)=soilmtc(t)+soilm(t,m)
        enddo
    enddo
!-----
! Change in Soil Moisture (kg/m2)
!-----
    delsoilmoist = soilmtc-clm%soilmtc_prev
    call t2gr(delsoilmoist,gtmp,ld%d%glbngrid,ld%d%glbnch,tile)
    write(ftn) gtmp
!-----
! Change in Snow water equivalent (kg/m2)
!-----
    delswe = clm%h2osno-clm%h2osno_prev
    call t2gr(delswe,gtmp,ld%d%glbngrid,ld%d%glbnch,tile)
    write(ftn) gtmp
!-----
! Surface State Variables
! Average Surface Temperature Calculation
!-----
    do t=1,ld%d%glbnch
!-----
! SnowT is the snow surface temperature, i.e. top layer t_soisno
!-----
        snowt(t)=0.
        if (clm(t)%itypwat/=istwet)then
            if(clm(t)%snl < 0)then
                snowt(t)=clm(t)%t_soisno(clm(t)%snl+1)
            endif
        endif
        if(snowt(t)==0.)snowt(t)=ld%d%udef
    enddo
!-----
! AvgSurfT is the average surface temperature which depends on
! the snow temperature, bare soil temperature and canopy temperature
!-----

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do t=1,ld%d%glbnch
  if(snowt(t).ne.ld%d%udef)then
    asurft(t)=clm(t)%frac_sno*snowt(t)+ &
      clm(t)%frac_veg_nosno*clm(t)%t_veg+ &
      (1-(clm(t)%frac_sno+clm(t)%frac_veg_nosno))* &
      clm(t)%t_grnd
  else
    asurft(t)=clm(t)%frac_veg_nosno*clm(t)%t_veg+ &
      (1-clm(t)%frac_veg_nosno)*clm(t)%t_grnd
  endif
enddo

clm%totqflx_ecanop=clm%totqflx_ecanop/float(clm%count)
cantrn=(clm%totqflx_tran_veg/float(clm%count))
bare=(clm%totqflx_evap_grnd/float(clm%count))
snowevp=(clm%totqflx_sub_snow/float(clm%count))
potevp=ld%d%udef
!-----
! Snow Temperature Calculation
!-----
do t=1,ld%d%glbnch
  snowtemp(t)=0.
  if (clm(t)%itypwat/=istwet)then
    if(clm(t)%snl < 0)then
      totaldepth(t)=0.
      do i=clm(t)%snl+1,0      ! Compute total depth of snow layers
        totaldepth(t)=totaldepth(t)+clm(t)%dz(i)
      enddo

      do i=clm(t)%snl+1,0      ! Compute snow temperature
        snowtemp(t)=snowtemp(t)+(clm(t)%t_soisno(i)*clm(t)%dz(i))
      enddo
      snowtemp(t)=snowtemp(t)/totaldepth(t)
    endif
    if(snowtemp(t).eq.0)snowtemp(t)=ld%d%udef
  endif
enddo
!-----
! Snow Temperature (K)
!-----
call t2gr(snowtemp,gtmp,ld%d%glbngrid,ld%d%glbnch,tile)
write(ftn) gtmp
!-----
! Canopy Temperature(K)
!-----
call t2gr(clm%t_veg,gtmp,ld%d%glbngrid,ld%d%glbnch,tile)
write(ftn) gtmp
!-----

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! Bare Soil Surface Temperature(K)
!-----
call t2gr(clm%t_grnd,gtmp,ld%d%glbngrid,ld%d%glbnch,tile)
write(ftn) gtmp
!-----
! Average Surface Temperature(K)
!-----
call t2gr(asurft,gtmp,ld%d%glbngrid,ld%d%glbnch,tile)
write(ftn) gtmp
!-----
! Effective Radiative Surface Temperature (K)
!-----
call t2gr(clm%t_rad,gtmp,ld%d%glbngrid,ld%d%glbnch,tile)
write(ftn) gtmp
!-----
! Surface Albedo
!-----
call t2gr(clm%surfalb,gtmp,ld%d%glbngrid,ld%d%glbnch,tile)
write(ftn) gtmp
!-----
! Snow Water Equivalent (kg/m2)
!-----
call t2gr(clm%h2osno,gtmp,ld%d%glbngrid,ld%d%glbnch,tile)
write(ftn) gtmp
!-----
! Subsurface State Variables
! Average Layer Soil Moisture (kg/m2)
!-----
do m=1,nlevsoi
  do c=1,ld%d%glbnch
    tempvar(c)=soilm(c,m)
  enddo
  call t2gr(tempvar,gtmp,ld%d%glbngrid,ld%d%glbnch,tile)
  write(ftn) gtmp
enddo
!-----
! Total Soil Wetness
! Calculation of Total column soil wetness and root zone soil wetness
! soilwtc = (vertically averaged soilm - wilting point)/
!           (vertically averaged layer porosity - wilting point)
! where average soilm is swetint, the wilting point is swetwilt,
! and avgwatsat is average porosity.
! totaldepth represents the total depth of all of the layers
!-----
do t=1,ld%d%glbnch
  swetint(t)=0.
  swetintr(t)=0.
  totaldepth(t)=0.

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avgwatsat(t)=0.
do m=1,nlevsoi
  avgwatsat(t)=avgwatsat(t)+clm(t)%dz(m)*clm(t)%watsat(m)
  totaldepth(t)=totaldepth(t)+clm(t)%dz(m)
  swetint(t)=swetint(t)+clm(t)%h2osoi_liq(m)
  swetintr(t)=swetintr(t)+clm(t)%rootfr(m)*clm(t)%h2osoi_liq(m)
enddo
avgwatsat(t)=avgwatsat(t)/totaldepth(t)
swetint(t)=(swetint(t)/denh2o)/totaldepth(t)
swetintr(t)=(swetintr(t)/denh2o)/totaldepth(t)
soilwtc(t)=100.*swetint(t)/avgwatsat(t)
enddo

call t2gr(soilwtc,gtmp,ld%d%glbngrid,ld%d%glbnch,tile)
write(ftn) gtmp
!-----
! Evaporation Components
! Vegetation Transpiration (kg/m2s)
!-----
call t2gr(cantrn,gtmp,ld%d%glbngrid,ld%d%glbnch,tile)
write(ftn) gtmp
!-----
! Bare Soil Evaporation (kg/m2s)
!-----
call t2gr(bare,gtmp,ld%d%glbngrid,ld%d%glbnch,tile)
write(ftn) gtmp
!-----
! Root Zone Soil Moisture (kg/m2)
! Calculation of root zone soil moisture
!-----
do t=1,ld%d%glbnch
  soilmr(t)=0.
  do m=1,nlevsoi
    soilmr(t)=soilmr(t)+clm(t)%rootfr(m)*clm(t)%h2osoi_liq(m)
  enddo
enddo

call t2gr(soilmr,gtmp,ld%d%glbngrid,ld%d%glbnch,tile)
write(ftn) gtmp
!-----
! Aerodynamic Conductance (m/s)
!-----
call t2gr(clm%acond,gtmp,ld%d%glbngrid,ld%d%glbnch,tile)
write(ftn) gtmp
if(ld%o%wfor .eq. 1) then
!-----
! Wind (m/s)
!-----

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call t2gr(sqrt(clm%forc_u*clm%forc_u+clm%forc_v*clm%forc_v), &
           gtmp,ld%d%glbngrid,ld%d%glbnch,tile)
write(ftn) gtmp
!-----
! Rainf (kg/m2s)
!-----
call t2gr(clm%forc_rain,gtmp,ld%d%glbngrid,ld%d%glbnch,tile)
write(ftn) gtmp
!-----
! Snowf (kg/m2s)
!-----
call t2gr(clm%forc_snow,gtmp,ld%d%glbngrid,ld%d%glbnch,tile)
write(ftn) gtmp
!-----
! Tair (K)
!-----
call t2gr(clm%forc_t,gtmp,ld%d%glbngrid,ld%d%glbnch,tile)
write(ftn) gtmp
!-----
! Qair (kg/kg)
!-----
call t2gr(clm%forc_q,gtmp,ld%d%glbngrid,ld%d%glbnch,tile)
write(ftn) gtmp
!-----
! PSurf (Pa)
!-----
call t2gr(clm%forc_pbot,gtmp,ld%d%glbngrid,ld%d%glbnch,tile)
write(ftn) gtmp
!-----
! SWdown (W/m2)
!-----
call t2gr(clm%forc_solad(1)*100.0/35.0,gtmp, &
           ld%d%glbngrid,ld%d%glbnch,tile)
write(ftn) gtmp
!-----
! LWdown (W/m2)
!-----
call t2gr(clm%forc_lwrad,gtmp,ld%d%glbngrid,ld%d%glbnch,tile)
write(ftn) gtmp
endif
close(ftn)
call stats(clm%totfsa,ld%d%udef,ld%d%glbnch,vmean,vstdev,vmin, &
           vmax)
write(ftn_stats,999)'Swnet(W/m2): ', &
           vmean,vstdev,vmin,vmax
call stats(clm%toteflx_lwrad_net,ld%d%udef,ld%d%glbnch, &
           vmean,vstdev,vmin,vmax)
write(ftn_stats,999)'Lwnet (W/m2): ', &

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      vmean,vstdev,vmin,vmax
call stats(clm%toteflx_lh_tot,ld%d%undef,ld%d%glbnch, &
           vmean,vstdev,vmin,vmax)
write(ftn_stats,999)'Qle (W/m2):    ', &
           vmean,vstdev,vmin,vmax
call stats(clm%toteflx_sh_tot,ld%d%undef,ld%d%glbnch, &
           vmean,vstdev,vmin,vmax)
write(ftn_stats,999)'Qh (W/m2):    ', &
           vmean,vstdev,vmin,vmax
call stats(clm%toteflx_soil_grnd,ld%d%undef,ld%d%glbnch, &
           vmean,vstdev,vmin,vmax)
write(ftn_stats,999)'Qg (W/m2): ', &
           vmean,vstdev,vmin,vmax
call stats(clm%totsnow,ld%d%undef,ld%d%glbnch,vmean,vstdev,vmin, &
           vmax)
write(ftn_stats,998)'Snowf (kg/m2s): ', &
           vmean,vstdev,vmin,vmax
call stats(clm%totrain,ld%d%undef,ld%d%glbnch,vmean,vstdev,vmin, &
           vmax)
write(ftn_stats,998)'Rainf (kg/m2s): ', &
           vmean,vstdev,vmin,vmax
call stats(clm%totqflx_evap,ld%d%undef,ld%d%glbnch, &
           vmean,vstdev,vmin,vmax)
write(ftn_stats,998)'Evap (kg/m2s): ', &
           vmean,vstdev,vmin,vmax
call stats(clm%totqflx_surf,ld%d%undef,ld%d%glbnch, &
           vmean,vstdev,vmin,vmax)
write(ftn_stats,998)'Qs (kg/m2s): ', &
           vmean,vstdev,vmin,vmax
call stats(clm%totqflx_drain,ld%d%undef,ld%d%glbnch, &
           vmean,vstdev,vmin,vmax)
write(ftn_stats,998)'Qsb (kg/m2s): ', &
           vmean,vstdev,vmin,vmax
call stats(clm%totqflx_snomelt/2.5e6,ld%d%undef,ld%d%glbnch, &
           vmean,vstdev,vmin,vmax)
write(ftn_stats,998)'Qsm (kg/m2s): ', &
           vmean,vstdev,vmin,vmax
call stats(delsoilmoist,ld%d%undef,ld%d%glbnch, &
           vmean,vstdev,vmin,vmax)
write(ftn_stats,998)'DelSoilMoist (kg/m2): ', &
           vmean,vstdev,vmin,vmax
call stats(delswe,ld%d%undef,ld%d%glbnch, &
           vmean,vstdev,vmin,vmax)
write(ftn_stats,998)'DelSWE (kg/m2): ', &
           vmean,vstdev,vmin,vmax
call stats(snowtemp,ld%d%undef,ld%d%glbnch,vmean,vstdev,vmin,vmax)
write(ftn_stats,999)'SnowT (K): ', &
           vmean,vstdev,vmin,vmax

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call stats(clm%t_veg,ld%d%undef,ld%d%glbnch,vmean,vstdev,vmin, &
           vmax)
write(ftn_stats,999)'VegT (K): ',vmean,vstdev,vmin,vmax
call stats(clm%t_grnd,ld%d%undef,ld%d%glbnch,vmean,vstdev,vmin, &
           vmax)
write(ftn_stats,999)'BaresoilT (K): ',vmean,vstdev,vmin,vmax
call stats(asurft,ld%d%undef,ld%d%glbnch,vmean,vstdev,vmin,vmax)
write(ftn_stats,999)'AvgSurfT (K): ',vmean,vstdev,vmin,vmax
call stats(clm%t_rad,ld%d%undef,ld%d%glbnch,vmean,vstdev,vmin, &
           vmax)
write(ftn_stats,999)'RadT (K): ',vmean,vstdev,vmin,vmax
call stats(clm%surfalb,ld%d%undef,ld%d%glbnch,vmean,vstdev,vmin, &
           vmax)
write(ftn_stats,999)'Albedo (-): ',vmean,vstdev,vmin,vmax
call stats(clm%h2ocan,ld%d%undef,ld%d%glbnch,vmean,vstdev,vmin, &
           vmax)
write(ftn_stats,998)'SWE (kg/m2):      ',vmean,vstdev,vmin,vmax

do m=1,nlevsoi
  do c=1,ld%d%glbnch
    tempvar(c)=soilm(c,m)
  enddo
  call stats(tempvar,ld%d%undef,ld%d%glbnch,vmean,vstdev,vmin,vmax)
  write(ftn_stats,995)'SoilMoist',m,' (kg/m2): ',vmean,vstdev,vmin,vmax
enddo

call stats(soilwtc,ld%d%undef,ld%d%glbnch,vmean,vstdev,vmin,vmax)
write(ftn_stats,999)'SoilWet (%): ',vmean,vstdev,vmin,vmax
call stats(cantrn/2.5e6,ld%d%undef,ld%d%glbnch, &
           vmean,vstdev,vmin,vmax)
write(ftn_stats,998)'TVeg (kg/m2s):  ', &
           vmean,vstdev,vmin,vmax
call stats(bare,ld%d%undef,ld%d%glbnch, &
           vmean,vstdev,vmin,vmax)
write(ftn_stats,998)'ESoil (kg/m2s): ', &
           vmean,vstdev,vmin,vmax
call stats(soilmr,ld%d%undef,ld%d%glbnch, &
           vmean,vstdev,vmin,vmax)
write(ftn_stats,999)'RootMoist (kg/m2): ', &
           vmean,vstdev,vmin,vmax
call stats(clm%acond,ld%d%undef,ld%d%glbnch,vmean,vstdev,vmin, &
           vmax)
write(ftn_stats,998)'ACond (m/s): ', &
           vmean,vstdev,vmin,vmax
if(ld%o%wfor.eq.1) then
  call stats(sqrt(clm%forc_u*clm%forc_u+clm%forc_v*clm%forc_v), &
             ld%d%undef,ld%d%glbnch,vmean,vstdev,vmin,vmax)
  write(ftn_stats,999)'Wind(m/s): ', &

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        vmean,vstdev,vmin,vmax
call stats(clm%forc_rain,ld%d%udef,ld%d%glbnch, &
           vmean,vstdev,vmin,vmax)
write(ftn_stats,998)'Rainf(kg/m2s): ', &
        vmean,vstdev,vmin,vmax
call stats(clm%forc_snow,ld%d%udef,ld%d%glbnch, &
           vmean,vstdev,vmin,vmax)
write(ftn_stats,998)'Snowf(kg/m2s): ', &
        vmean,vstdev,vmin,vmax
call stats(clm%forc_t,ld%d%udef,ld%d%glbnch,vmean,vstdev,vmin, &
           vmax)
write(ftn_stats,999)'Tair(K): ', &
        vmean,vstdev,vmin,vmax
call stats(clm%forc_q,ld%d%udef,ld%d%glbnch,vmean,vstdev,vmin, &
           vmax)
write(ftn_stats,999)'Qair(kg/kg): ', &
        vmean,vstdev,vmin,vmax
call stats(clm%forc_pbot,ld%d%udef,ld%d%glbnch,vmean, &
           vstdev,vmin,vmax)
write(ftn_stats,999)'PSurf(Pa): ',&
        vmean,vstdev,vmin,vmax
call stats(clm%forc_solad(1)*100.0/35.0,ld%d%udef,ld%d%glbnch, &
           vmean,vstdev,vmin,vmax)
write(ftn_stats,999)'SWdown(W/m2): ', &
        vmean,vstdev,vmin,vmax
call stats(clm%forc_lwrad,ld%d%udef,ld%d%glbnch,vmean, &
           vstdev,vmin,vmax)
write(ftn_stats,999)'LWdown(W/m2): ', &
        vmean,vstdev,vmin,vmax
endif
995 format (1x,a10,I1,a9,4f14.3)
999 format (1x,a15,4f14.3)
998 format (1x,a15,4e14.3)

```